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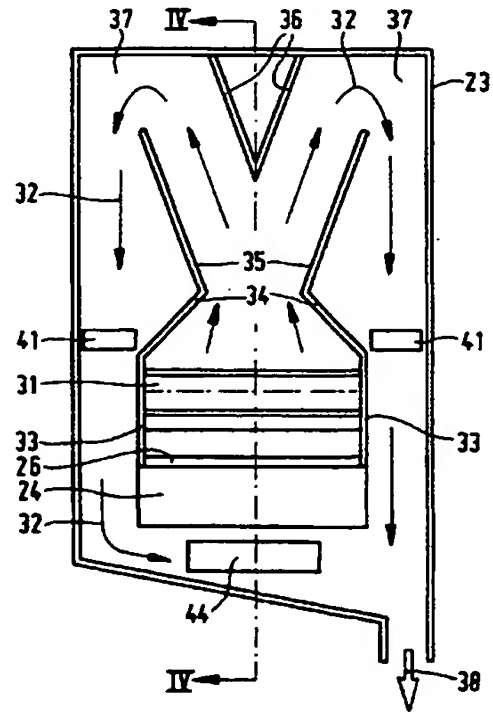
(57) Abstract

A device for processing crustaceans, provided with a blowing device comprising means for effecting an upward air flow, through which peeled crustaceans may be passed. The blowing device is provided with an air duct for the air flow, which air duct comprises a constricted part with a passage which is at least 25 % smaller than the cross-sectional area of the upstream air duct. A method for processing crustaceans, wherein a flow of moving, peeled crustaceans is passed through an upward air flow.



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A DEVICE AND A METHOD FOR PROCESSING CRUSTACEANS

The invention relates to a device and a method for processing crustaceans, such as shrimps. The peeling of crustaceans cannot easily be done in such a manner that one the one hand the flesh intended for consumption and on the other hand shell parts and other impurities can be discharged fully separated from each other. Generally the flesh of the crustaceans intended for consumption will also contain remnants of shell parts and other impurities.

A conventional method for removing the impurities from the flesh of the crustaceans intended for consumption, such as shrimps, is to spread the crustaceans on a so-called picking table, which is preferably provided with a conveyor belt, whereupon the impurities in question are removed by hand. This method is problematic, both from a hygienic point of view and for reasons of cost efficiency.

The object of the invention is to provide a device and a method by means of which remnants of shell parts and other impurities can be removed from peeled crustaceans, such as shrimps, in an efficient and reliable manner.

In order to accomplish this objective the device for processing crustaceans according to the invention is provided with a blowing device comprising means for effecting an upward air flow, through which peeled crustaceans may be passed, said blowing device being provided with an air duct for the air flow, which air duct comprises a constricted part with a passage which is at least 25% smaller than the cross-sectional area of the upstream air duct. By using this device the peeled crustaceans are lifted by the air flow, after which they fall back again, whilst shell parts and other impurities are carried along with the air flow.

A device for separating shell portions from a meat product portion of crawfish tail by an air flow is described in US-A-4,928,352. Thereby the product is transported in an upward air flow and directed towards a vein which catches the heavier material, while the lighter dorsal and ventral shell portions pass beyond the vein.

According to one aspect of the invention sorting means may furthermore be present for removing shell parts and impurities from the peeled crustaceans before said crustaceans pass the blowing device.

According to another aspect of the invention picking means provided with a table comprising a conveyor belt may furthermore be provided, on which the crustaceans may be inspected after they have passed the blowing device.

According to another aspect of the invention at least one part of the air duct is substantially rectangular, whereby the long side extends transversely to the direction of supply of the crustaceans. The narrowed part may thereby be formed by a constriction element, which is located at the long cross-sectional side of the downstream air duct, seen in the direction of supply of the crustaceans. In this manner an effective air flow is obtained in the blowing device.

According to another aspect of the invention it is also possible for the air duct to have two constricted parts, the second constricted part being located downstream, seen in the direction of the air flow, and being formed by two constriction elements extending into the air duct from the short cross-sectional sides of said air duct. According to another aspect of the invention the air duct may comprise a bend located behind the constriction or constrictions, said bend deflecting the air flow from an upward to a downward

direction. It is also possible to provide two mutually symmetric bends.

Further aspects of the invention are mentioned in the claims, illustrated in the drawing and/or explained in more detail in the description of the Figures.

The invention also relates to a method for processing crustaceans, such as shrimps, wherein a flow of moving, peeled crustaceans is passed through an upward air flow, which air flow, after the flow of crustaceans has passed, is led through a constriction. Further aspects of this method are mentioned in the claims and are explained in more detail with reference to an embodiment to be described hereafter.

By way of illustration the invention will be described hereafter with reference to an embodiment of the device for processing crustaceans shown in the drawing.

Figure 1 is a plan view of the device;

Figure 2 is a side view of the device;

Figure 3 is a front view of the blowing device;

Figure 4 is a sectional view of the blowing device, along the line IV-IV in Figure 3;

Figures 5A, 5B, 5C and 5D are a plan view, a front view, a bottom view and a side view respectively of a composite blow nozzle;

Figure 6 is a partial front view of a screen deck according to the arrow VI in Figure 7; and

Figure 7 is a sectional view of a screen deck along the line VII-VII in Figure 6.

The Figures are only diagrammatic illustrations of the embodiment.

Figures 1 and 2 show a feed hopper 1, a batching chute 2, a sorting device 3, a blowing device 4, and a picking device 5. The feed hopper 1 is a downwardly tapering container having an outlet opening 6 for depositing peeled shrimps on the batching chute 2. The feed hopper 1 is provided with an imbalance motor 7 for vibrating the feed hopper 1. The batching chute 2 is connected to a frame 9 by means of a vibrating mechanism 8. Said vibrating mechanism 8 is adjustable, so that it is possible to adjust the amount of peeled shrimps carried to the sorting device 3.

The sorting device 3 is provided with a number of screen decks 10, both between the upper longitudinal girders 11 and between the lower longitudinal girders 12. Figure 1 shows only the four upper screen decks 10. The screen decks 10 will be described in more detail hereafter with reference to Figures 6 and 7.

The blowing device 4, which will be described in more detail hereafter with reference to Figures 3 and 4, is secured to the frame 11, 12 of the sorting device 3. The frame 11, 12 of the sorting device 3 is spring-connected to the frame 9 and is provided with a vibrating motor 13, which can vibrate both the sorting device 3 and the blowing device 4.

The shrimps from the feed hopper 1, which have been processed via the batching chute 2, the sorting device 3 and the blowing device 4, land on a picking device 5, which consists of a table, above which a conveyor belt extends. The sorting device 3 and the blowing device 4 remove shell

parts and other impurities from the flow of peeled shrimps, whereby the peeled shrimps, via the discharge means 15 (indicated as the discharge chute 29 in Figure 4), and the impurities, via the discharge means 16 (indicated by the arrow 38 in Figure 3), land on the conveyor belt 14. The conveyor belt 14 is passed over a starting pulley 17 and an end pulley 18. Near said end pulley 18 the peeled shrimps can be caught separated from the impurities removed therefrom. A scrape-off means 19 is provided near the end pulley 18 to keep shrimps from sticking to the conveyor belt 14. Furthermore a dirt scraper 20 is provided, which functions to keep the conveyor belt clean. The picking device 5 enables a visual inspection of the peeled shrimps.

The frame 9 is provided with a plurality of supports 21, in which storage bins may be placed, if desired.

Figures 3 and 4 show the blowing device indicated by numeral 4 in Figures 1 and 2. Figure 3 is a front view and Figure 4 is a sectional view along the line IV-IV in Figure 3. The cover plate 22 shown in Figure 4 has been left out in Figure 3 to show the interior of the blowing device.

Figure 4 shows the housing 23, within which an air compression chamber 24 is present, which is supplied with air, which may or may not be cooled, via the supply pipe 25. The upper side of the air compression chamber 24 is formed by a composite blow nozzle, which is for example made of plastic material. The blow nozzle 26 is provided with a plurality of substantially vertical air passages 27, which effect an upward air flow in the blowing device. The shrimps supplied via the feed chute 28 pass this upward air flow, as a result of which they are blown up together with the impurities that are present. Only the peeled shrimps fall back again, and they are subsequently discharged via the discharge chute 29, as indicated by the arrow 30.

A constriction element 31 in the shape of an angle section is provided above the composite blow nozzle 26. Due to the presence of said constriction element 31 the passage for the upward air flow is locally narrowed, so that an acceleration and a deceleration of the air flow occurs.

The housing 23 of the blowing device is covered by a cover plate 22, which is preferably made of a transparent material, so that it is possible to check the operation of the blowing device. The discharge chute 29 is secured to said cover plate 22.

Figure 3 is a front elevational view of the blowing device, wherein the cover 22 is removed. Arrows 32 indicate the air flow. Said air flow takes place through air ducts, which are formed by a number of walls 33, 34, 35, 36, which are provided in the housing 23 of the blowing device. From the composite blow nozzle 26 the walls 33 first extend parallel to each other, the constriction element 31 being mounted between said walls, whereupon the walls 34 extend obliquely towards each other. This causes a second constriction of the air duct, as a result of which a renewed acceleration of the air flow is effected. Then the air duct divides through the walls 35 extending obliquely outwards and two walls 36 mounted in the shape of a wedge. The air flow divided in this manner is then deflected in downward direction in the bends 37 of the air duct. Then the air flow exits the blowing device at the bottom side, indicated by the arrow 38, whereby shell parts and other impurities are carried along.

Arrow 39 in Figure 4 indicates where the peeled shrimps from the row of lower screen decks of the sorting device enter the blowing device. Arrow 40 indicates where shell parts and other impurities supplied by the upper row of screen decks enter the blowing device, namely through openings 41, so that said impurities are carried along by

the air flow and exit the blowing device at the point indicated by the arrow 38.

Impurities which have landed under the lower row of screen decks are supplied via a feed chute 42, as indicated by the arrow 43, said impurities being carried to the air flow via the opening 44 and likewise exiting the blowing device at the point indicated by the arrow 38.

As already explained with reference to Figure 1 the shell parts and the impurities are deposited on the conveyor belt 14 via the discharge means 16, whilst the peeled shrimps are deposited on the conveyor belt 14 via the discharge means 15.

Figures 5A, 5B, 5C en 5D show the composite blow nozzle 26 in plan view, front view, bottom view and side view respectively. Air passages 27 indicated by dashed lines in Figure 5D are present in the blow nozzle. At the bottom side of the blow nozzle (on the right in Figure 5D) the channels comprise a conical part, which is conducive to a satisfactory passage of the air flow and which prevents noise from being generated. A satisfactory air flow above the composite blow nozzle 26 can be improved by providing air passages 27 with different diameters and having a number of said air passages inclined upwards.

In figure 5A the direction in which the shrimps move over the nozzle is indicated with arrow 51. The air passages are arranged in four rows directed tranversely with respect to arrow 51. In figure 5A the air passages in the first row and at both sides (left and right) have a larger diameter with respect to the other air passages, for example 2 mm, and the innermost air passages in the fourth row have a smaller diameter, for example 1 mm. The other air passages may have a diameter in between.

Also an improved air flow can be obtained by inclined air passages. As shown in figure 5D, which is a side view of figure 5A, the direction of the air passages are converging in the upward direction. In figure 5D the inclination of the air passages in the first row is 14°, in the second row is 7°, in the third row is 0° and in the fourth row is -7°. A similar convergency is shown in figure 5B, which is also a side view of figure 5A.

The blow nozzle, which may be made of plastic material, may have a thickness of for example 10 mm, whilst the diameter of the air passages may range from 1 - 3 mm. The mutual spacing between the air passages may for example range from 5 - 15 mm.

Figures 6 and 7 show details of a screen deck 10 as present in the sorting device 3. Each screen deck 10 consists of a tubular beam 45 provided transversely to the direction of displacement of the shrimps, four of said beams being provided between the upper longitudinal girders 11 as well as between the lower longitudinal girders 12 (see Figure 2). A plurality of bars 46 are mounted inside the tubular beam 45, said bars having a square cross-section. Furthermore a plurality of small bars 47 having a circular cross-section are provided inside the tubular beam 45. As is apparent from Figure 7, the small bars 47 are considerably shorter than the bars 46. Said bars and small bars extend entirely through the tubular beam 45, so that they can secured to the tubular beam 45 in two places. As a result of this an optimum fastening strength is achieved.

The screen deck operates as follows. The shrimps move across the screen deck from the left to the right (Figure 7), whereby large parts remain supported on the bars 46, because they are too large to fall through these two bars. The smaller parts of the flow of shrimps fall through the

bars 46, so that a separation in the flow of shrimps is obtained.

The shrimps on the screen decks are driven along as a result of the screen decks being vibrated by means of a vibrating motor 13. The vibration thus produced is directed obliquely upwards towards the right in Figure 7, so that the larger parts present on the bars 46 are moved towards the right. It may occur thereby that certain parts land between two bars 46 in such a manner, that they can neither move upwards nor downwards. These parts will not be moved by the vibrating force any more. In order to keep the screen decks from becoming clogged by these parts, stop means in the shape of small bars 47 are provided, which ensure that said clogging cannot take place on the front part of the screen deck. As a result of this the shrimps present on the front part of the screen deck will constantly push along any parts clogging the screen deck.

Preferably the bars 46 extend slightly obliquely towards the outside from their point of attachment in the tubular beam 45.

The screen decks are arranged and dimensioned in such a manner that the shrimps fall through the upper screen decks but not through the lower screen decks. Consequently they are supplied to the blowing device by the lower screen decks, as is indicated by the arrow 39 in Figure 4. The larger impurities are carried to the blowing device by the upper screen decks via openings 41 (Figure 3), as is indicated by the arrow 40 in Figure 4, whilst the smaller impurities are supplied under the lower screen decks, as is indicated by the arrow 40 in Figure 4.

Preferably the screen decks 10 are arranged in such a manner, that the bars 46 slope slightly upwards with their free ends.

According to the invention the air which is supplied to the air compression chamber via the supply pipe 25 (Figure 4) can be humidified. Water can be dripped into the supply pipe. As a result of this addition of moisture the operation of the blowing device is improved, in particular the adherence of dirt can be avoided in this manner, and furthermore the extent of dehydration of the shrimps can be reduced. By evaporating water in the supply pipe the air flow is cooled, which may constitute a considerable advantage.

Furthermore the rate of flow of the air may be controlled independently of the amount of shrimps being supplied. As a result of this an optimum air flow can be adjusted for each individual flow of shrimps.

According to the invention the vibrating motor 13 (Figure 2) may be of the type provided with a magneto which intermittently attracts a piece of metal, which piece of metal is removed from the magneto again by spring means. Contrary to what is suggested in Figure 2 the angle with the horizontal at which the vibration is carried out may be less than 45°, whereby the sorting device 3 is moved towards the left (seen in Figure 2) by energizing the magneto, whilst the movement towards the right is effected under the influence of the spring means.

According to the invention the scrape-off means 19 (Figure 2) may furthermore consist of a non-circular, for example polygonal bar, which is provided at some distance, for example 3 mm, from the conveyor belt 14. As a result of this the shrimps are removed from the conveyor belt, whilst smaller impurities stick to the conveyor belt 14 and are not touched by the scrape-off roller 19. These impurities are removed by the dirt scraper 20. Water may be sprayed onto the conveyor belt 14 between the scrape-off roller 19 and the dirt scraper 20, in order to clean and possibly

cool the conveyor belt. Cooled water may be used for that purpose. Both the dirt scraper 20 and a guide pulley present near said dirt scraper may remove the water from the conveyor belt 14.

It will be apparent that the blowing device according to the invention may also be used in conjunction with a peeling machine for crustaceans, whereby the blowing device is used for one of the final operations following peeling.

CLAIMS

1. A device for processing crustaceans, provided with a blowing device comprising means for effecting an upward air flow, through which peeled crustaceans may be passed, said blowing device being provided with an air duct for the air flow, which air duct comprises a constricted part with a passage which is at least 25% smaller than the cross-sectional area of the upstream air duct.

2. A device according claim 1, characterized in that sorting means are present for removing shell parts and impurities from the peeled crustaceans before said crustaceans pass the blowing device.

3. A device according to any one of the preceding claims, characterized in that picking means provided with a table comprising a conveyor belt are present, on which the crustaceans having passed the blowing device may be inspected.

4. A device according to any one of the preceding claims, characterized in that at least one part of the air duct has a substantially rectangular cross-section, with a long side extending transversely to the direction of supply of the crustaceans.

5. A device according to claim 4, characterized in that said constricted part may be formed by a constriction element, which is located at the long cross-sectional side of the downstream air duct, seen in the direction of supply of the crustaceans.

6. A device according to any one of the preceding claims, characterized in that said air duct comprises two constricted parts, the second constricted part being

located downstream, seen in the direction of the air flow, and being formed by two constriction elements, which extend into said air duct from the short cross-sectional sides of said air duct.

7. A device according to any one of the preceding claims, characterized in that said air duct is provided with a bend downstream of said constriction.

8. A device according to claim 7, characterized in that said bend deflects the air flow from an upward to a downward direction.

9. A device according to claim 7 or 8, characterized in that said air duct divides into two ducts, which are each provided with a bend.

10. A device according to any one of the preceding claims, characterized in that said air duct extends upwards and subsequently downwards in such a manner that the shell parts and impurities carried along by the air flow can be discharged via the conveyor belt of the picking device.

11. A device according to any one of the preceding claims, characterized in that said blowing device is provided with a composite blow nozzle having a plurality of air passages, which are directed upwards, said blow nozzle having a substantially flat upper surface, across which the crustaceans can be moved.

12. A device according to claim 11, characterized in that said air passages are spread over said upper surface, the mutual spacing between said air passages ranging from 5 - 15 mm.

13. A device according to claim 11 or 12, characterized in that the diameter of said air passages ranges from 1 - 3 mm.

14. A device according to claim 11, 12 or 13, characterized in that the diameter of the air passages located downstream, seen in the direction of supply of the crustaceans, is larger than that of the air passages located further upstream.

15. A device according to any one of the claims 11-14, characterized in that the diameter of the air passages located further towards the outside, seen in the direction of supply of the crustaceans, is larger than that of the air passages located further inwards.

16. A device according to any one of the claims 11-15, characterized in that the air passages located downstream and/or upstream, seen in the direction of supply of the crustaceans, are directed slightly inclined towards the centre of the blowing device.

17. A device according to any one of the claims 11-16, characterized in that the air passages located further towards the outside, seen in the direction of supply of the crustaceans, are directed inclined towards the centre of the blowing device.

18. A device according to any one of the claims 11-17, characterized in that said blow nozzle is detachably provided in said blowing device.

19. A device according to any one of the claims 11-18, characterized in that said blow nozzle is made of plastic material or another corrosion-resistant material.

20. A device according to any one of the claims 11-19, characterized in that said blow nozzle forms the partition between an air compression chamber and the processing room for the peeled crustaceans.

21. A device according to claim 20, characterized in that the entrances of the air passages adjacent to the air compression chamber are conical.

22. A device according to any one of the preceding claims, characterized in that said sorting means are provided with vibrated screen decks comprising bars lying side by side, which extend substantially in the direction of movement of the crustaceans with their free ends.

23. A device according to claim 22, characterized in that said bars extend slightly obliquely towards the outside from the centre of said screen deck.

24. A device according to claim 22 or 23, characterized in that a stop means is provided between two bars, near their point of attachment.

25. A device according to claim 24, characterized in that said stop means consists of a short small bar, which extends substantially parallel to said bars.

26. A device according to any one of the preceding claims, characterized in that a row of upper screen decks and a row of lower screen decks are provided, whereby the bars of the upper screen decks are spaced apart further than the bars of the lower screen decks, and whereby the blowing device joins the row of lower screen decks.

27. A device according to any one of the preceding claims, characterized in that said blowing device is fixedly connected to a vibrating motor.

28. A device according to claim 27, characterized in that said blowing device is fixedly connected to said sorting means, which are connected to a vibrating motor.

29. A device according to any one of the preceding claims, characterized in that said blowing device is provided with a cover plate, which is at least partially made of a transparent material, in order to be able to observe whether the blowing device is operating correctly.

30. A device according to claim 29, characterized in that a discharge chute for discharging the crustaceans is secured to said cover plate.

31. A method for processing crustaceans, such as shrimps, wherein a flow of moving, peeled crustaceans is passed through an upward air flow, which air flow, after the flow of crustaceans has passed, is led through a constriction.

32. A method according to claim 31, characterized in that said peeled shrimps are passed over sorting means beforehand, where shell parts and impurities are at least partially removed from said flow of peeled crustaceans.

33. A method according to any one of the preceding claims, characterized in that said flow of peeled crustaceans is then passed over picking means, in order to be able to carry out an inspection, for example a visual inspection of the crustaceans.

34. A method according to any one of the claims 31-33, characterized in that said upward air flow is generated in a substantially rectangular part of the duct through which the crustaceans are passed, whereby the long side

of said rectangle extends transversely to the direction of supply of the crustaceans.

35. A method according to claim 34, characterized in that said air flow is slightly convergent.

36. A method according to any one of the claims 31-35, characterized in that said air flow is passed through an air duct comprising one or more constrictions.

37. A method according to any one of the claims 31-36, characterized in that said air flow is deflected from an upward to a downward direction.

38. A method according to any one of the claims 31-37, characterized in that said blowing device, in which the crustaceans are exposed to an upward air flow, is vibrated.

39. A method according to any one of the claims 31-38, characterized in that said peeled crustaceans are deposited in a feed hopper, after which they are carried to a sorting device via a vibrating batching chute, where said crustaceans are sorted on a plurality of screen decks, whereby parts which are too large or too small are discharged, whilst the selected crustaceans are exposed to an air flow, wherein the remaining shell parts and other impurities are removed from said flow of crustaceans, whereupon the crustaceans thus cleaned are discharged.

40. A device according to any one of the claims 1-30, characterized in that said screen decks are arranged in such a manner, that the bars extend slightly upwards at their free ends.

41. A device according to any one of the claims 1-30 or 40, characterized in that means are provided for humidifying the air which is supplied to the blowing device, for example by feeding drops of water to the supply pipe.

42. A device according to any one of the claims 1-10 or 40-41, characterized in that the vibrating motor for driving said sorting device is provided with a magneto, which can be energized intermittently, thereby attracting a piece of metal, which piece of metal is moved back again, away from said magneto, by spring means, whereby said spring means provide the movement in the direction of displacement.

43. A device according to any one of the claims 1-30 or 40-42, characterized in that said peeled crustaceans are removed from said conveyor belt by a scrape-off means, which is provided with a non-circular, for example polygonal bar, which rotates at some distance from said conveyor belt.

44. A device according to claim 43, characterized in that said bar is provided at a distance of 1 - 4 mm from said conveyor belt.

45. A device according to any one of the claims 1-30 or 40-44, characterized in that said conveyor belt is cleaned and/or cooled by spraying water onto said belt.

46. A method according to any one of the claims 31-39, characterized in that the air supplied to the blowing device is humidified, for example by feeding drops of water to the supply pipe.

47. A method according to any one of the claims 31-39 or 46, characterized in that said peeled crustaceans are removed from said conveyor belt by a scrape-off means, which is provided with a non-circular, for example polygonal bar, which is provided at some distance from said conveyor belt, for example 1 - 4 mm.

48. A method according to any one of the claims 31-39 or 46-47, characterized in that the amount of air supplied to said blowing device is controlled, in particular in dependence on the amount of crustaceans being supplied.

49. A method according to any one of the claims 31-39 or 46-48, characterized in that said conveyor belt is cleaned and/or cooled by spraying water, which may be cooled, onto said belt.

50. A peeling device for crustaceans, such as shrimps, said device being provided with a blowing device as described in the preceding claims.

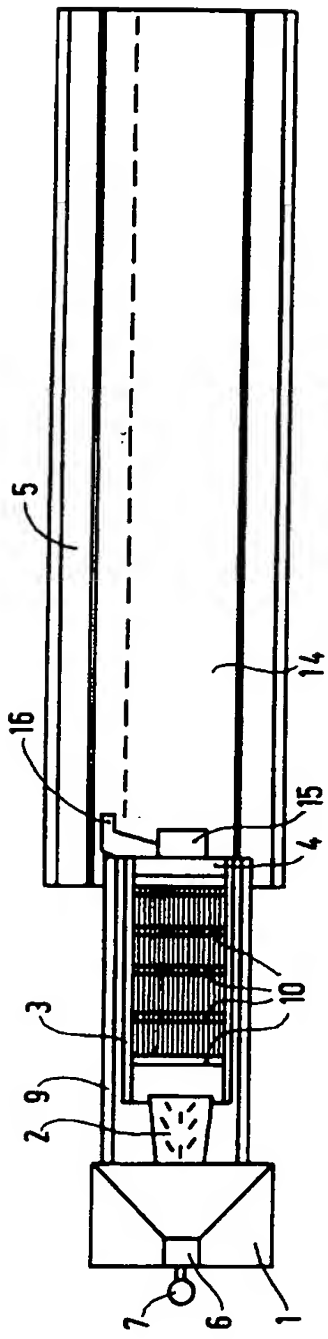

FIG.1

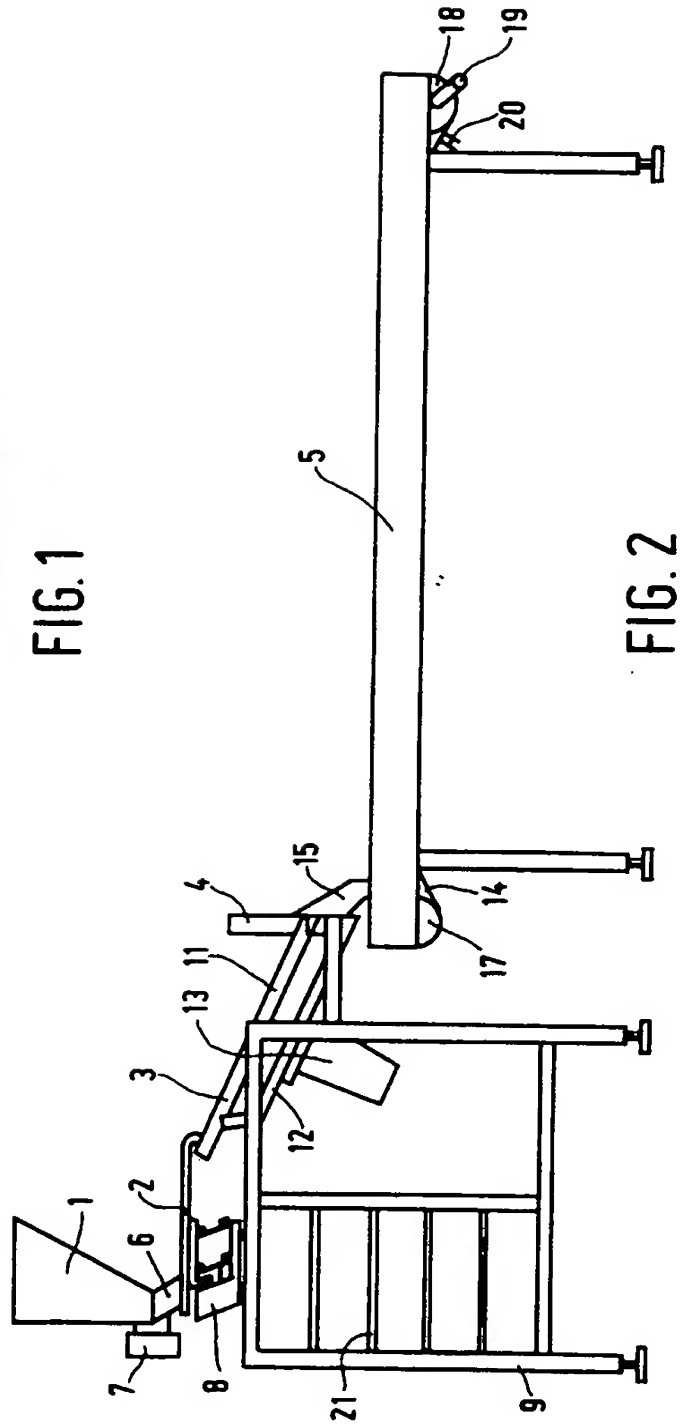

FIG. 2

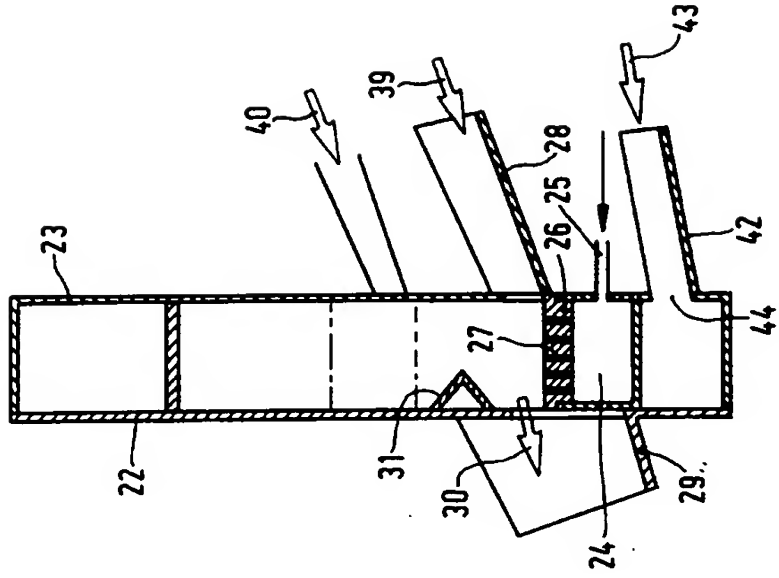
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FIG. 4

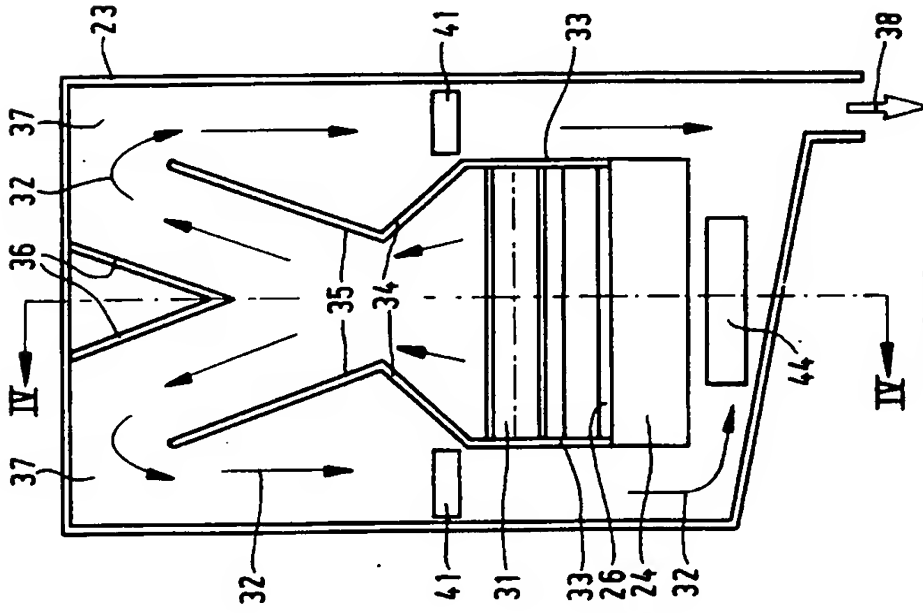
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FIG. 3

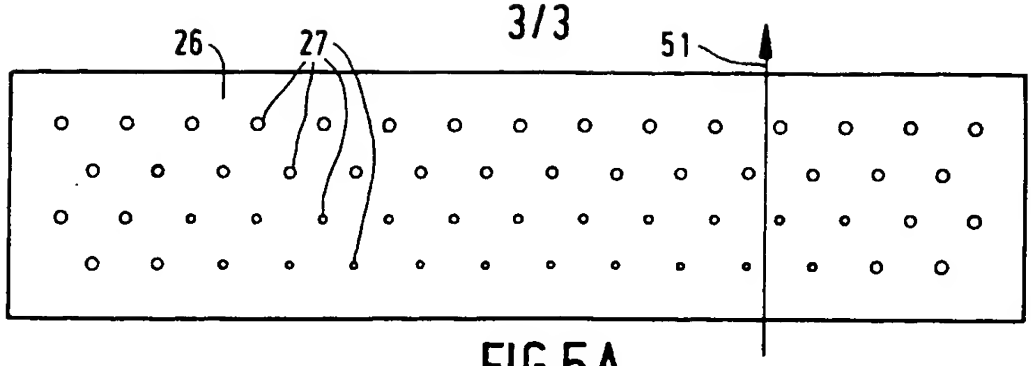

FIG.5A

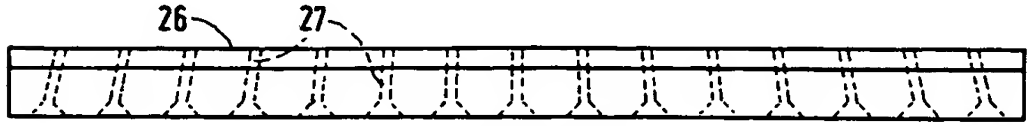

FIG.5B

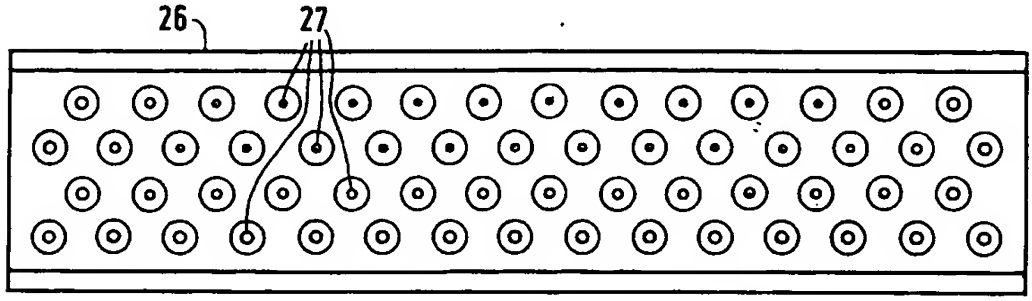

FIG.5C

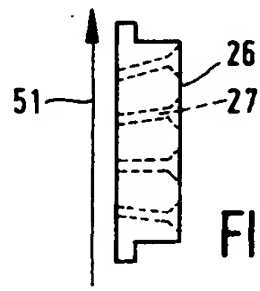

FIG.5D

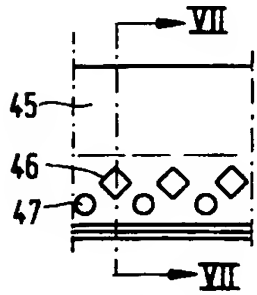

FIG.6

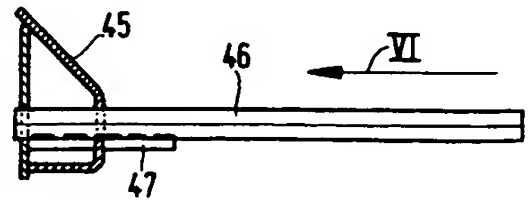

FIG.7